

MEAN ANGULAR MOMENTA OF PRIMARY PHOTOFISSION PRODUCTS

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Many problems still remain in fission process description, among which are interplay between nuclear structure effects and fission dynamic peculiarities in forming different fission characteristics, specifically of angular momenta distribution $P(I)$ of primary fragments. One of the most simple and rather reliable method to deduce information on spin distribution $P(I)$ (and hence on mean angular momenta $\langle I \rangle$) is based on investigations of independent yield of isomer states with different spins (isomer ratios, σ_m/σ_g) in evaporation residues of primary fission products.

In this work isomer ratios and mean angular momenta for photofission products of ²³⁷Np and ²³⁸U are obtained. The method of gamma-ray spectrometry of fission products without radiochemical separation[1] are used with some modification for isomeric ratio determination. The nuclei are irradiated by microtron M-30 bremsstrahlung induced by electrons with energies 15 MeV and 16 MeV. Different irradiation and cooling time are used (1-120 min) to obtain optimal conditions for data acquisition. Gamma-ray spectra of photofission products are also analyzed at different time intervals to perform correct identification of the products. The contributions of genealogically related beta-decay branches are taken into account by solving of differential equation system of radioactive decay and growth in isobar chain of investigated nuclide.

As a result the following values of isomer ratios for photofission products are determined:
²³⁷Np — $\sigma(8^-)/\sigma(4^+) = 2.4 \pm 0.2$ for ¹³⁴I, $\sigma(11/2^-)/\sigma(3/2^+) = 0.61 \pm 0.06$ for ¹³⁵Xe
²³⁸U — $\sigma(8^-)/\sigma(4^+) = 1.2 \pm 0.2$ for ¹³⁰Sb, $\sigma(8^-)/\sigma(4^+) = 0.79 \pm 0.13$ for ¹³²Sb, $\sigma(11/2^-)/\sigma(3/2^+) = 0.032 \pm 0.015$ for ¹³³Te, $\sigma(8^-)/\sigma(4^+) = 0.67 \pm 0.13$ for ¹³⁴I and $\sigma(11.2^-)/\sigma(3/2^+) = 0.22 \pm 0.03$ for ¹³⁵Xe.

The modified version of EMPIRE-II code[2] is used to obtain spin distributions and mean angular momenta of primary photofission products. The preliminary results are in rather good agreement with that ones from [1], where values $\langle I \rangle$ were determined in fragments of ²³²Th fission induced by 14 MeV neutrons.

1.I.N.Vishnevsky, V.A.Zheltonozhsky, N.V. Strilchuk et al. Physics of Atomic Nuclei, 1998, 61, 1562.

2.M.Herman, R.Capote-Noy, P.Oblozinsky, A.Trkov, V.Zerkin. J.Nucl.Sci.Technol. Suppl.2, 2002.V1, 116; <http://www-nds.iaea.org/empire/>